Letter of July 22, 1931

From

Thaddeus Merriman, Consulting Engineer

to

W. P. Whitsett,

Chairman, Board of Directors

in regard to the

WATER REQUIREMENTS OF

THE METROPOLITAN WATER DISTRICT

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346 Broadway, New York.
July 22, 1931.

Mr. W. P. Whitsett, Chairman,
Board of Directors,
Metropolitan Water District of
California,
Los Angeles, California.

Dear Mr. Whitsett:

You have asked me to study a number of recent reports and writings relating to several questions which are now in the forefront of discussion before the Metropolitan Water District. These questions may be stated as follows:

1. WHAT ARE THE PRESENT AND FUTURE NEEDS OF THE DISTRICT FOR MORE WATER?

2. HOW LONG WILL THE PRESENT SUPPLIES MEET THE SITUATION WHICH NOW EXISTS?

3. WHEN SHOULD STEPS BE TAKEN TOWARD SECURING AN ADDITIONAL SUPPLY?

4. WHAT SHOULD BE THE CAPACITY OF THE COLORADO RIVER AQUEDUCT?

The subjects thus presented are of vital concern to every citizen and taxpayer of the District. The people who will bear the cost of whatever development is finally determined upon are entitled to the best and soundest advice which is to be had, so that when the time to vote arrives, they may do so in the knowledge that their ballots will be cast for the best interests of the District. For this reason I shall analyse these four questions from the viewpoint of my experience on the water supply of New York City, and on the basis of the broader features of the situation which are of universal application and come within the understanding of all men. Absolute truth is easily understood, while confusion often arises when mere technical details are allowed to enter a discussion and to confuse the issue.

Before proceeding to answer these questions I will lay a groundwork of fact and present the situation as I see it so that you may fully understand the reasons that underlie the responses which I shall make.

THE METROPOLITAN DISTRICT. Your District is a great, vital, and growing community and must have water for all the uses and purposes of humanity. In considering this question

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it is necessary, therefore, to first think in terms of people. How has the District been growing, and how will it continue to grow? Records of past growth are easily obtainable, while predictions for the future depend on the exercise of judgment and on comparisons with the growth of other similar districts. In making such comparisons, however, the natural differences between the districts which are being compared must not be overlooked. Then further, account must be taken of the reasons for the differences themselves. By this I mean that simple statistical comparisons are likely to be misleading, and unless we go to the bottom of the subject we may fail to fully understand it.

DISTRICTS COMPARED. Let us now compare the Metropolitan districts of Southern California, Chicago, and New York, and see how they have grown. The following table shows the population of these districts for each year from 1880 to 1930:

TABLE 1

Year	Southern California	Chicago	New York
1880	60,000	730,000	2,800,000
1890	160,000	1,300,000	3,650,000
1900	230,000	2,000,000	5,100,000
1910	650,000	2,650,000	7,100,000
1920	1,100,000	3,450,000	8,400,000
1930	2,500,000	4,550,000	10,150,000

These figures are most impressive and show that from 1920 to 1930 these districts made the following gains:-

New York	1,750,000
Southern California	1,400,000
Chicago	1,100,000

Now, what were the reasons that lead to a greater growth in Southern California than in Chicago, and why did Southern California, smaller as it is, show a growth well up to that of New York. Before we can safely venture a prediction for the future, this question must be answered, and our answer must be both sound and logical because it will influence our final conclusions.

REASONS FOR GROWTH. I have given much thought to this subject and believe that the recent growth of the Metropolitan District which, by the way, was both greater and more rapid than that on any other area of equal population in all recorded history, was due to the primary fact that:-

SOUTHERN CALIFORNIA HAS MORE TO OFFER TO THE PEOPLE OF THE UNITED STATES IN THE WAY OF COMFORT, HEALTH AND OPPORTUNITY THAN ANY OTHER SIMILAR DISTRICT IN ALL OF OUR GREAT LAND.

This is not a condition which either can or will change quickly or suddenly. It is sure to continue unless something which cannot be foreseen happens. No cause of this kind is now in sight and when the bearing of the following collateral facts is noted, further argument will seem unnecessary.

A. This great growth of the past ten years has occurred under modern conditions of transportation and in spite of restricted emigration.

B. The unmistakable tendency throughout the United States is for people to locate themselves in suburban areas around about centers of population. The Metropolitan District comprises an area of precisely this character.

C. No other part of the United States has even approximately the same natural inherent capacity of drawing population to itself, and therefore, the Metropolitan District has been growing at the expense of all the rest of the country.

D. Growth begets growth. It brings about increased business and greater local markets which, in turn, attract industry, and where there is industry, there will the people go. Moreover, if there be a choice, the decision will be in favor of going to that place where living conditions are the best. That explains the ever growing popularity of Southern California.

Does this presentation leave room for doubt as to the future? If so, the following figures furnish even more food for thought.

TABLE 2

State or District	Population 1920	Population 1930	Increase	Percent Increase
Southern California	1,100,000	2,500,000	1,400,000	127.0
California (State)	3,427,000	5,677,000	2,250,000	65.7
Florida (State)	968,500	1,468,000	499,500	51.6
Michigan (State)	3,668,000	4,842,000	1,174,000	32.0
New York (City proper)	5,620,000	6,930,000	1,310,000	23.0

How is the fact to be accounted for that 64 per cent of the total increase for the entire State of California, or 1,450,000, occurred in the Metropolitan District, while the remainder of the State gained only 36 per cent, or 800,000?

Why did more people move into the Metropolitan District than into New York City proper?

Why did the Metropolitan District show a gain almost as great as that of Florida and Michigan both combined?

The answers to the above questions are all the same, namely:

MORE PEOPLE CAME INTO THE METROPOLITAN DISTRICT BECAUSE IT OFFERED THEM THAT FOR WHICH THEY WERE LOOKING. THIS, INDEED IS THE ONLY REASON WHICH CAUSES PEOPLE TO MOVE. AND THE NUMBER THAT ACTUALLY MOVE IS A MEASURE OF THE ATTRACTING POWER OF A DISTRICT.

Let us now consider the attracting powers of the districts and states we have been discussing. That is to say, let us see how many people were attracted to each during the past ten years in proportion to the number that were there in 1920. The following tabulation shows the results:-

TABLE 3

District or State	Population In 1920	Gain to 1930	Attracting Power	Relative Rank in Attracting Power
New York City Metropolitan area	8,400,000	1,750,000	0.22	1.00
New York (City proper)	5,620,000	1,310,000	0.23	1.04
Chicago Metropolitan area	3,450,000	1,100,000	0.32	1.45
Michigan (State)	3,668,000	1,174,000	0.32	1.45
California (Remainder of state)	2,377,000	800,000	0.34	1.55
Florida	986,500	499,500	0.50	2.27
Southern California	1,100,000	1,450,000	1.31	6.00

So is it made clear that the attracting power of your four Southern counties during the past 10 years was six times as great as that of the New York Metropolitan area; it was four times that of Chicago, and nearly four times that of all the rest of the State of California. These figures portray the quality of the growth of your District. Nothing could make this demonstration clearer.

FUTURE GROWTH. From whatever angle the question of population growth is viewed it is more than obvious that the causes which brought 1,450,000 people into the District will continue unabated. Thousands of people everywhere have their eyes turned to Southern California and their hearts set on sooner or later becoming part of the District. Who is so pessimistic as to say that these forces and causes of recent growth will become less potent in the future? What is it that will cause the attracting power of the District to be reduced? I know of no such cause, nor have I heard any such seriously suggested. Nevertheless there is one possibility which must not be overlooked. If the water supply of the District is allowed to fall behind then, inevitably, growth will slacken and cease. This, however, is an unthinkable condition because it is one which the District can control. The people of Southern California will never permit so disastrous a circumstance to happen. What then, will the growth of the future be?

FUTURE POPULATION. The most reliable method of estimating the future population of the four counties is to compare their past growth with that of the United States as a whole and then to project the future on the basis of the past. This method has the great advantage of presenting the problem on the basis of a direct comparison between the whole and one of its parts. It is a method which is applicable to predicting the population

of any city or district, and debits or credits each one with the composite of all the causes that affect and control its growth and development.

Proceeding to this method the necessary data are shown in the following tabulation:

TABLE 4

Population of the Four Counties from 1880 to 1960 Based on previous records, both of the Counties and of the United States.

Year	Population of United States	Population of the Four Counties	Per cent which The Counties are of the United States	Increase In Percentage Rate
1880	50,156,000	60,000	0.12	----
1890	62,948,000	160,000	0.27	0.15
1900	75,995,000	230,000	0.30	0.03
1910	91,972,000	650,000	0.71	0.41
1920	105,711,000	1,100,000	1.04	0.33
1930	122,775,000	2,500,000	2.04	1.00
1940	135,000,000	4,100,000	3.04	1.00
1950	147,000,000	5,900,000	4.04	1.00
1960	160,000,000	8,100,000	5.04	----

Thus does it appear that the population of the four counties in 1960 will exceed 8,000,000 souls. This is a conservative estimate and does no violence to the facts. It gives full faith and credit to all of the attractive features of the District and recognizes not only that there is ample space for 8,000,000 people but also room for many more in the years after 1960. This method, moreover, gives consideration to the picture presented by the map of the United States. On this map the present comparable population centers are all east of the Mississippi River. The unmistakable trend is toward the establishment of another such center west of the Mississippi and there is only one spot in all that vast territory which measures up to the requirements. That spot is the Metropolitan District of Southern California both because of its manifold advantages, and because of how it has already grown. This estimate, moreover, is reasonable and conservative because I have assumed no increase in the percentage rate of increase beyond 1930. This assumption is, I believe, an unlikely one, and the population in 1960 will, most probably, be substantially greater than 8,000,000.

To some the foregoing may seem like an optimistic estimate, but if we should now conclude that the growth during the next 10 years will be no greater than during the past 10 years, we must necessarily admit that the District today offers less of attraction and inducement than it did ten years ago when it was less than half as large. That is the rub of the situation. All statistics and barometers of business show that the possibilities of Southern California are greater now than ever before. Why then should the future rate of growth lessen? No reason for such a condition appears, and for the District to look forward to a slackening in its growth now, when it has only begun to grow, would be precisely equivalent to selling Southern California short. That is inconceivable because every fact points the way to great and surpassing growth. The signposts along the road unmistakably indicate a population of 8,000,000 people before 1960.

THE PROBLEM BEFORE THE DISTRICT

Thus does the main problem before your District appear as that of providing water for the needs of a population of 5,900,000 by 1950 and 8,000,000 by 1960, (See Table 4) together with the water which will be needed for both industry and irrigation.

REQUIREMENTS OF POPULATION AND INDUSTRY. The population demand, including the needs of industry, may be placed at the following figures:

1930	130	gallons	per	capita
1940	140	"	"	"
1950	150	"	"	"
1960	160	"	"	"

These quantities for the per capita requirements are based on an industrial use of 25 per cent of the total, the remainder covering domestic and municipal needs. These figures also take into account the fact that, as each year passes a little more water is used for the maintenance of better conditions of health and cleanliness.

The future needs of the District for domestic, municipal and industrial purposes will, therefore, be as follows:-

TABLE 5

Year	Population	Per capita Use	Total, Million gallons daily	Total In Second-feet
1940	4,100,000	140	574	861
1950	5,900,000	150	885	1327
1960	8,000,000	160	1280	1920

TOTAL FUTURE REQUIREMENTS INCLUDING AGRICULTURE

The matter of agricultural uses has been discussed in much detail in the various reports which I have carefully examined and, believing their conclusions to be sound, I have adopted the figures from them in column 3 below. The total uses are thus forecast as follows:

TABLE 6

Year	Use by Population & Industry Second-Feet	Use by Agriculture Second-Feet	Total requirements Second-feet
1940	861	825	1686
1950	1327	981	2308
1960	1920	986	2906

These are the requirements of the future for which provision must be made. How may they best be met? To answer this question we must know how much water can be counted on as now being available. Let us inquire as to this.

WATER NOW AVAILABLE

First and most important among the present sources of supply are the Los Angeles City system. Their total capacity under normal conditions, including the further development of the Owens and Mono basins is 440 second-feet. The Los Angeles River and other local sources have a capacity of 130 second-feet, thus indicating a total supply of 570 second-feet. Of this 356 second-feet were used during 1930. The remainder of the District generally, is no more than holding its own and, in fact, the water levels of its several underground basins are rapidly sinking under the drafts which they are called on to maintain. Some additional water may possibly be developed by the storage of flood flows at various locations. Certain of these have been completed, and others are now in progress. The quantity of water which these developments may make available is, however, problematical and, in case of low rainfall, they will of course be ineffective. They cannot, therefore, be safely counted on as furnishing any large quantity of additional and dependable water. At the very most they may operate to relieve the overdrafts on certain of the underground basins.

So do the figures show that the total available supply in excess of all present uses (without allowance either for overdrafts or for flood water storage, which may be assumed to

balance each other) is 570 minus 356 second-feet, or 214 second-feet. This quantity be it noted must take care of all new agricultural uses and of all of the population requirements until water can be brought in from the Colorado River. It must also suffice to cover any deficiency that may result because of low rainfall from now on until the completion of the Colorado Aqueduct.

For the situation thus shown to exist there is but one possible offset, namely, the reclamation of sewage and its substitution for water used in industry and irrigation. This is a saving that will eventually become absolutely necessary, but the cost will be high and the returns low. Moreover, the substitution will not be accomplished without resistance from many quarters. It is my judgment that the reclamation of sewage cannot now be reasonably depended on to increase the quantity of water available to the District. The best field for the use of such water will be in those industries where quality is not of first importance. A comprehensive plan for the use of reclaimed sewage should be developed under the auspices of the Metropolitan District at the same time that the Colorado Aqueduct is being advanced, so that the full measure of benefit to be derived from this potential source may be made available at the earliest practicable time. It is far from conservative to assume that reclaimed sewage can promptly be made available for use. Before sewage can be counted on as relieving the situation, it must be used day after day by actual consumers until the practicability of its use has been amply demonstrated. Until then it cannot be considered as a dependable asset.

The present available surplus of only 214 second-feet, representing 140 million gallons daily, is sufficient to meet the needs of only 1,000,000 additional people, which number will be in the District no later than 1937. Still further, if all of this surplus water is used by the population and by industry, then none of it will be available for additional irrigation.

And what after 1937? By 1940, as I have shown, the total water requirement will be 1686 second-feet, or practically 400 second-feet beyond the capacity of all then existing sources* In other words, by 1940 there should be available a new supply of not less than 400-second-feet, and if a new aqueduct is then at hand, it will undoubtedly be operated at not less than 600 second-feet so as to give opportunity for the depleted underground basins to replenish themselves.

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*The normal capacity of all existing sources may be said to be 1500 second-feet, but by 1940 the inevitable overdrafts will have reduced this figure so that no more than 1300 second-feet may be safely counted on.

This is the situation which confronts your District today. By 1940 you should have 600 second-feet of new water available for use and delivery. Quite possibly you may need this quantity even sooner than 1940 for, as the bottoms of the underground basins are approached, their yields will fall off and each year will see the situation become more tense and more difficult than it is today. It is neither wise nor prudent for any community to complacently face a situation such as that which the facts disclose. To do nothing at all will lead to disaster, while to delay action is to hazzard the most serious of consequences.

The wonderful underground basins of your District constitute an asset of inestimable value. The water they hold may be likened to money in a bank where it can be drawn upon as necessary. When, however, the drafts exceed the deposits, then the balances fall off correspondingly and, as bottom is approached, the bank notifies the depositor accordingly. This is exactly what is now happening in the underground banks of the District. The water deposits are running low, overdraft notices have been sent out, and the day of reckoning is not far distant. Bankruptcy is an unpleasant thing for the individual to contemplate, and even the financial bankruptcy of a community is a simple affair as compared with the consequences of a bankruptcy in water. One single such occurrence could easily cause more damage and injury than the cost of several new aqueducts would represent. So it is that I counsel you to proceed without delay to make the Colorado River Aqueduct a reality, and thus place the people of the District in such a condition of security that no possible shortage of water can cause them financial injury or expose them to the even worse loss of position and prestige.

THREE QUESTIONS ANSWERED

In view of the foregoing, it is now possible to answer the first three questions which are set down at the head of this letter:-

(1) THE PRESENT NEEDS OF THE DISTRICT FOR MORE WATER ARE URGENT AND IMPERATIVE. THE REQUIREMENTS OF THE FUTURE CAN ONLY BE PROVIDED FOR BY FIRST MEETING THOSE OF THE PRESENT.

(2) THE DISTRICT IS FORTUNATE IN HAVING AVAILABLE A SMALL SURPLUS OF WATER, BUT THIS WILL NOT SERVE THE REQUIREMENTS BEYOND 1937, AND THEN ONLY AT THE EXPENSE OF A DANGEROUS DEPLETION OF THE UNDERGROUND RESERVES.

(3) NEW AND ADDITIONAL WATER MUST BE MADE AVAILABLE NOT LATER THAN 1937. TO INSURE REASONABLE SAFETY IT OUGHT TO BE AVAILABLE BY 1934. THIS, HOWEVER, IS IMPOSSIBLE AS SIX YEARS WILL BE REQUIRED TO BRING COLORADO RIVER WATER INTO USE.

THE SIZE OF THE COLORADO RIVER AQUEDUCT

The fourth question yet remains to be considered. What should be the size of the Colorado River Aqueduct? In view of what I have already written and the figures in Table 6, the answer is simple. By 1940 this aqueduct will be carrying 600 second-feet, and by 1960 it will be delivering 1400 second-feet or practically the complete capacity for which it has been designed. In view of this showing, it would clearly be an economic waste to build it to a capacity of less than 1500 second-feet.

An aqueduct of 500 second-feet capacity would barely meet the requirements up to 1940. One capable of carrying 1000 second-feet would hardly satisfy the demand beyond 1950, and would save only $20,000,000 of the cost for the full size. This difference in cost, moreover, will place no measurable burden on the present generation because it will most largely be paid by the people of the future who will derive the benefits it will confer.

THE FOURTH QUESTION ANSWERED

The answer to the last question then is:-

(4) THE CAPACITY OF THE COLORADO RIVER AQUEDUCT SHOULD BE NOT LESS THAN 1500 SECOND FEET.

As I see this problem, it would be both wise and prudent to build this aqueduct to a capacity of 2,000 second-feet. Yet, because of the increased difficulties of driving tunnels larger than about 16 feet, and remembering the difficult geological conditions that will be encountered, I am unable to recommend this greater capacity. There is a practical limit of size beyond which it is unwise to go, and that limit for this aqueduct is close to a capacity of 1500 second-feet.

Having now answered all of the questions, I venture to call your attention to a few other points which seem to me to have an important bearing on your problems.

THE SIGNIFICANCE OF THE RAINFALL RECORDS

There is an almost universal tendency for people to think of water supply in terms of average rainfall records and to form conclusions accordingly. That this is a dangerous procedure was well shown last year when a severe drought visited large areas of our country on both sides of the Mississippi river and reduced many waterwork systems to virtual impotency. The storage on our own New York Catskill System, designed on a most liberal basis, was drawn down to the vanishing point. This condition came suddenly and without warning. In order to meet it, every possible precaution was taken. The streets went unwashed, all hose permits were cancelled, pressures were reduced, and the conscience of the people was appealed to in an unprecedented manner through every conceivable means of publicity. Fortunately, just as it seemed that practically 1/2 of the city's total water would be entirely cut off, the rains came and the situation was relieved.

Words are inadequate to express how anxious the people were. Neither can they describe how vital and important a thing the water supply of the city suddenly became. Never before had such a condition occurred. The people were dumbfounded to think that their water systems could suddenly, and for any reason whatever, fail. That experience brought home to me the danger and the futility of pinning faith too closely on rainfall records. I have long felt, but am now thoroughly convinced, that we have far from lived either through the driest period or the driest year that will come. Our water supplies must satisfactorily meet the driest of times, and they are useless unless they have sufficient reserve capacity so to do. The total of your present sources of supply, in proportion to the demands upon them, is just about at the level of being able to meet the demand of today under conditions of average rainfall. Your reserve capacity is far from sufficient and, as the District grows, the margin of safety will rapidly diminish and the accumulated reserves in the underground basins will be drawn

down even further than they now are, with little hope of ever being refilled.

Now that your District has grown to great size, the problem of your water supply is far more important than ever before. A small community may shift along on an inadequate supply. Its risks are small and inconsequential. A great District, however, can afford to take no chances. Its water supply must be built at least up to the standard of its other civic accomplishments, and these are always far in advance of any thesis which predicates the sufficiency of its water supply on the average rainfall. This is the most fundamental of the considerations which underlie the situation before you. The District must build up its water supply so that it will be well above the average. Even now it is not up to that standard, and each passing year will see its efficiency more and more reduced. At any time a single year of drought may come and do its worst.

Six years at least remain before the Colorado Aqueduct can be completed and before the menace of drought can be removed. Thus do I sum up my suggestions. The people of Southern California must be told what the situation before them is. They must be told the facts which I have presented in such language that they will clearly understand. Then, when these facts are separated out from the background of multitudinous and unimportant details which now becloud the true issue, the people will know that their safety and every hope of future progress lies absolutely in the waters of the Colorado River. Knowing this, there is no doubt that they will at once authorize the Colorado Aqueduct and thereby render themselves secure against the danger which threatens. Only so can a clear title to the future be obtained, and only so may another facet be cut on the great Jewel which is Southern California. Then she will shine even more brilliantly and can give notice everywhere that she has water in plenty to serve the needs of all who would come to her hearthstone.

THE COST OF COLORADO WATER DURING THE PERIOD OF CONSTRUCTION

The taxpayer very naturally and rightly asks what it will cost to make the water supply situation safe? He is entitled to know because whatever is done will be done for him and with his money.

Let us see what the cost will be. The outside figure for the money needed to complete the construction of the first development, including terminal storage and distribution systems is $218,844,000.

This money will be secured through the sale of bonds and expended during a period of six years, as shown in the tabulation together with interest requirements for each year.

Year	Expenditure during year	Total to end of year	Interest at 4-3/4% with credit for interest not payable during year, including taxes
First 1932	$ 3,403,400	$ 3,403,400	$ 96,000
Second 1933	21,319,700	24,723,100	772,000
Third 1934	21,863,300	46,586,400	1,799,000
Fourth 1935	42,605,200	89,191,600	3,470,000
Fifth 1936	62,707,200	151,898,800	6,058,000
Sixth 1937	66,945,200	218,844,000	9,245,000
		Total Interest	$ 21,440,000

It is thus seen that the total money which must be raised in order to pay the interest and taxes during the six years up to 1937 is only $21,440,000. In other words, to bring the aqueduct into being and make it a reality there need be raised by taxation or otherwise* no more than $21,440,000. This, on the basis of the present population, of 2,500,000, represents a total expenditure of only $8.58 per person during six years, or less than four-tenths of one cent per person per day. Three quarters of this total, moreover, will not be due before 1936 and 1937. The average hat with an average pair of shoes would cost $8.58, but they would hardly last for six years and no one could get six years' time in which to pay for them.

Still further, this total of $21,440,000 is like the premium on an insurance policy which guarantees that there will be no danger of drought after 1937. Is a policy of that kind worth while? If so, where could insurance so complete, so adequate and so certain be bought at as low a price? What insurance company, for a premium of $21,440,000, would insure the District against all loss, damage and injury that might be caused by the occurrence of a drought during the four or five years following 1937? Between now and 1937, of course, the District must carry its own risk. For this there is no alternative.

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* From some points of view it may be considered advisable to charge the cost of interest during construction to the undertaking itself and pay this cost with bond money. This question may be argued either way, but in the end it will make little difference which method is chosen.

This, as I see it, is what the taxpayer must hold firmly in his mind. How far can he afford to chance the welfare of the community by declining to do his share toward freedom from the risk of danger? I am sure that everyone who has the interest of the District at heart will, when he understands the situation, more than gladly make his contribution to the cost of the Colorado River Aqueduct, which, after all, is essentially a Community affair. Everything your District has is based on water. Lack of water will cause it to stand still and to shrink. If you do not soon set your hand to the task of this aqueduct, you may not hereafter be able to build it except under the stress of necessity and in order to make the most of what may remain after a drought has spent its course. Southern California is one of the garden spots of the world, but her people must always remember that she was wrought out of the desert and that only water can keep the desert from reclaiming its own. Would your District make its fair garden larger and more permanent? If so, the job can be done only with the water of the Colorado River. None other is to be had.

THE COST OF COLORADO WATER AFTER THE AQUEDUCT HAS BEEN COMPLETED

After the aqueduct goes into service and begins to deliver water, the annual cost for interest on the investment will continue, and to this will be added the cost of pumping, of maintenance and of operation, etc. If the quantity pumped is 600 second-feet, then the annual cost in 1938 will be as follows:-

Interest on bonds	$10,395,000
Power for pumping	3,012,000
Maintenance, operation, taxes, insurance and all costs	2,463,000
Total	$15,870,000

That will be the condition in 1938, when your population will be close to 3,500,000 and the annual per capita cost will then be $4.54, or 1.25 cents per person per day. Does that seem an extravagant amount to pay for the ownership of a great aqueduct, for absolute safety against drought, and for 600 second-feet or 400,000 acre feet of water as well? If this water were sold for as little as $20.00 per acre foot the revenue would be $8,000,000, and the amount necessary to be raised by taxation would be only $7,870,000, ($15,870,000 less $8,000,000) and this, for 3,500,000 people, represents a per capita cost of $2.25, or six-tenths of one cent per person per day. How could any money be invested more wisely for any purpose?

In the 15th year, that is in 1946, the redemption of the bonds will begin and will thereafter add $8,100,000* each year to the cost to be paid. Let us see what the cost of the water will be for that year. The population then being 5,000,000 and the quantity of water delivered by the aqueduct 800 second-feet, not a large increase over 1938 because the ground water basins will have made a substantial recovery, the cost figures follow:-

Redemption of bonds	$ 8,100,000
Interest on bonds	10,395,000
Pumping	3,645,000
Maintenance and operation and all other costs	2,499,000
Total	$24,639,000

The total per capita cost is thus seen to be $4.93, or 1.40 cents per person per day and if, as in 1938, the water now totaling 530,000 acre feet, is still sold for $20.00 per acre foot, the cost to be raised by taxation will be $24,639,000 less $10,600,000, or $14,039,000, which represents a per capita cost of $2.81, or three-quarters of one cent per person per day.

Thus do the figures run. Beyond 1946 the amortization cost will remain constant, while the interest cost will decrease. The quantity of water pumped and available for sale will increase year by year, as also will the population. The deferred parts of the aqueduct will be built and on this account the interest charges will be slightly increased, but the per capita tax charges will steadily decrease and will never be greater than the figures given above for 1946.

This, simply stated, is the financial picture of the Colorado Aqueduct. In order to present it I have assumed that a part of the cost of the undertaking will be carried by taxation and a part by the water delivered. To set up a charge reasonably to be placed on the water, I have assumed an average of $20.00 per acre foot which, for the purposes of this discussion, is a reasonable figure. Some of the water may be sold for more and some for less. As I see it, however, the exact rate is not important at this time because, whatever the rates which may be charged will be, they will be fixed from time to time by the several cities composing the District. Each of them will have the right to determine its own policy and fix

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* I have supposed that the bonds will be for 50 years and will be redeemed in 35 equal installments beginning in the 15th year. With the total cost of the development at $283,536,000, each installment will then be $8,100,000.

its own rate accordingly. This is not a matter which can be determined now. In fact, it can be determined only by the member cities each for itself and, even then, the rates will of necessity be subject to change from time to time at the discretion of the communities themselves. I regret to see that there has been a tendency to bring this question forward to the exclusion of the far more important one of deciding whether it is necessary to proceed to develop more water immediately.

That, after all, is the only question now before your District, because, irrespective of cost, Southern California must have this water. In any event, moreover, the cost, even if all of it should be included in the tax budgets and the water delivered free, would be a small item for so prosperous a District. No equal sum spent for any purpose whatever could possibly yield so great a return of benefit. No other investment your District could make would do so much to insure its future prosperity. If you do not soon build this aqueduct your growth will have to slacken and your valuations will diminish accordingly.

As I come to the end of this review it is needless for me to point out that, from the financial point of view, there has never been a better time for advancing the Colorado Aqueduct. The more quickly it is put under way the less will be its construction cost and the better will be the terms at which your bonds can be sold.

New York City's Catskill Aqueduct was built during the lean years following the depression of 1907 and, as a result, the city obtained the utmost for its money. Conditions now approximate those of 1907. The cost of materials is unbelievably low and the employment which will be afforded to labor, if you proceed promptly, will do its full share toward the return of prosperity. By going ahead now, you may get the Colorado Aqueduct at 10 per cent under the present estimates and at a substantial further saving on the bond interest rate.

To sum up in one word more. The Metropolitan District must have this Colorado water just as soon as it can possibly be gotten. Even so, it may not be made available quickly enough. The next six years will be anxious ones for you and even if the rainfall comes up to the average you will still have to undergo a shortage. As Southern California measures her cloth so shall she cut it and, as she provides herself with water, so shall she profit in the years to come. And that, by the way, is true of every great community. All civilization has its roots deep down in its water systems.

Very truly yours,

THADDEUS MERRIMAN,
Consulting Engineer.

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